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Microcontainers as an oral drug delivery system

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Oral delivery is the preferred administration route for drugs. Advanced drug delivery (ADD) systems help in achieving targeted and/or sustained delivery in the gastro-intestinal (GI) tract after oral administration. Micro fabricated drug delivery devices have been proposed as an ADD system being able to increase the oral bioavailability of drugs [1]. Of these micro devices, microcontainers are suggested as especially promising [2]. Primarily, this is due to the fact that the size and shape of the microcontainers can be controlled very precisely and therefore, polydispersity as seen for example for micro- and nanoparticles is avoided [3]. Microcontainers are polymeric, cylindrical devices in the micrometre size range (Figure 1) [4]. A major advantage is that these devices allow for unidirectional release, as only one side of the microcontainers is open compared to microparticles where release can occur over the whole area of the particle [5].

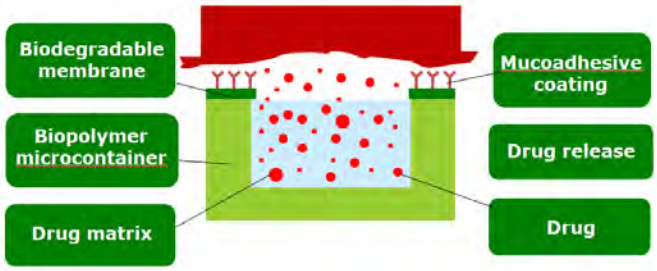

Figure 1. Conceptual design of microcontainers for oral drug delivery

SU-8 microcontainers were fabricated using lithography, whereas PLLA microcontainers were prepared by hot embossing. In terms of drug filling, the SU-8 microcontainers were filled with polyvinylpyrrolidone (PVP) by inkjet printing followed by supercritical CO_2 impregnation of ketoprofen into the PVP matrix. As an alternative filling method, the powder furosemide (p-Furo) were filled into the SU-8 microcontainers. The PLLA microcontainers were filled with drug formulation by embossing the microcontainers into a polycaprolactone (PCL) and furosemide layer. For the p-Furo filled microcontainers, an pH-sensitive lid of Eudragit L100 was spray coated onto the cavity of the microcontainers. Release of p-Furo from the coated microcontainers was investigated using a µ-Diss profiler in simulated intestinal medium. A fast release of ASSF was facilitated from the SU-8 microcontainers. *In-vivo* rat studies were performed showing high oral bioavailability.

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